In the Claims:

1. (Amended) An apparatus for transporting a high speed data stream over a channel [made up] consisting of a plurality of relatively low bandwidth twisted copper pair lines, comprising

an encoder for applying an error correction encoding scheme to said high speed data stream;

a plurality of modem elements coupled to said plurality of twisted copper pair lines, each modem element associated with one of said copper pair lines and configured to operate at a data rate, delay, signal to noise ratio and bit error rate independent of other modem elements;

a dispatcher operative to divide said encoded high speed data stream into a plurality of low rate data streams to be transmitted by said plurality of modem elements, said dispatcher adapted to forward a low rate data stream to each modem element in accordance with the data rate of each modem;

a collector operative to combine a plurality of data streams received by said plurality of modem elements into a received high speed data stream;

a decoder adapted to receive said data stream output from said collector and to apply an error correction decoding scheme so as to generate the original high speed data stream.

14. (Amended) The apparatus according to claim 1, further comprising one or more service channel modules, each service channel module adapted to provide an interface between a [telephony] telecom or datacom service and said high speed data stream.

24 (Amended) The apparatus according to claim 1, further comprising means for measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, transmitting more sensitive [low rate] data streams over more spatial centrally located pairs within a binder.

25. (Amended) The apparatus according to claim 1, further comprising means for measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, transmitting more robust [low rate] data streams over pairs situated closer to the outer boundary of a binder.

30. (Amended) The apparatus according to claim 1, further comprising Near End Crosstalk (NEXT) cancellation means, comprising:

means for generating an estimate of a NEXT transfer function of the crosstalk caused by radiators nearby to a modem element;

means for generating an estimate of a NEXT disturbance signal in accordance with said estimated NEXT transfer function; and

means for subtracting said estimate of a NEXT disturbance signal from the signal received by a modem element.

50. (Amended) The apparatus according to claim 1, wherein said encoder is operative to generate a plurality of codewords, each codeword consisting of a payload portion containing K-R bytes and a redundancy portion consisting of R bytes, wherein K and R are chosen such that no more than R/2 [symbols] bytes are corrupted in the event one or more lines are cut thus providing resiliency to a specified number of cut lines.

52 (Amended) [A method of] The apparatus according to claim 1, further comprising means for selecting the parameters for codewords generated by [an] said encoder so as to provide desired resiliency to line failures, minimum bit error rate (BER) and maximum bandwidth, said parameters consisting of K and R, wherein K-R represents the number of bytes in a payload portion of said codeword and R represents the number of bytes in a redundancy portion of said codeword, wherein said codewords are distributed to [a] said plurality of modem elements for transmission over [a] said plurality of low bandwidth twisted copper pair lines, each modem element having a data rate, delay, signal to noise ratio and BER independent of other modem elements, [said method] comprising [the steps of]:

means for [for all valid combination of codeword size K and redundancy length R,] computing the maximum number of bytes from a codeword to be sent over each modem element in accordance with its corresponding data rate, for all valid combinations of codeword size K and redundancy length R;

means for [for all combinations of line failures,] summing the number of [bits] bytes from a single codeword to be transmitted, for all combinations of line failures;

means for marking this combination only if said sum is less than R/2;

means for [for all marked combinations,] computing the overhead for all marked combinations; and

means for selecting from among all combinations of K and R wherein an associated overhead was computed, the combination yielding a minimum overhead.

54. (Amended) A dispatcher for distributing a high speed data stream among a plurality of modem elements, comprising:

a two dimensional buffer comprising a plurality of cells arranged as a plurality of rows and columns, each row associated with a different modem element and each column representing a single symbol, transmitted at the highest transmission rate;

an input sequencer adapted to distribute said high speed data stream to cells in said buffer, the amount of data distributed to each row is determined in accordance with the particular data rate of the modem corresponding thereto; and

an output [sequence] sequencer adapted to distribute the contents of the cells in said buffer to said plurality of modem elements.

58. (Amended) A method of transporting a high speed data stream over a plurality of relatively low bandwidth twisted copper pair lines, said method comprising the steps of:

providing a plurality of modem elements, each modem coupled to a twisted pair line;

dividing said high speed data stream into a plurality of low rate data streams, each having independent data rate, delay and bit error rate (BER), for distribution over said plurality of modem elements;

transmitting said plurality of low rate data streams via said plurality of modem elements over said plurality of twisted pair lines;

adapting the data rate of each modem in accordance with the quality of the twisted pair line associated therewith;

receiving a plurality of low rate data streams over said plurality of twisted pair lines; and

assembling said plurality of low rate received data streams so as to yield the original high speed data stream.

81. (Amended) The method according to claim 58, further comprising the step of measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said measurements, transmitting more sensitive [low rate] data streams over more spatial centrally located pairs within a binder.

82. (Amended) The method according to claim 58, further comprising the step of measuring, on a periodic basis, one or more twisted pair line parameters and in accordance with said

A9 measurements, transmitting more robust [low rate] data streams over pairs situated closer to the outer boundary of a binder.

86 (Amended) The method according to claim 58, further comprising the steps of:

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generating an estimate of a NEXT transfer function of the crosstalk caused by radiators nearby to a modem element;

generating an estimate of a NEXT disturbance signal in accordance with said estimated NEXT transfer function; and

subtracting said estimate of a NEXT disturbance signal from the signal received by a modem element.

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104. (Amended) The method according to claim 58, further comprising the step of error correction encoding said high speed data stream so as to generate a plurality of codewords, each codeword consisting of a payload portion containing K-R bytes and a redundancy portion consisting of R bytes, wherein K and R are chosen such that no more than R/2 [symbols] bytes are corrupted in the event one or more lines are cut thus providing resiliency to a specified number of cut lines.

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106. (Amended) A method of selecting the parameters for codewords generated by an encoder so as to provide desired resiliency to line failures, minimum bit error rate (BER) and maximum bandwidth, said parameters consisting of K and R, wherein K-R represents the number of bytes in a payload portion of said codeword and R represents the number of bytes in a redundancy portion of said codeword, wherein said codewords are distributed to a plurality of modem elements for transmission over a plurality of low bandwidth twisted copper pair lines, each modem element having a data rate, delay, signal to noise ratio and BER independent of other modem elements, said method comprising the steps of:

for all valid combination of codeword size K and redundancy length R, computing the maximum number of bytes from a codeword to be sent over each modem element in accordance with its corresponding data rate;

for all combinations of line failures, summing the number of [bits] bytes from a single codeword to be transmitted;

marking this combination only if said sum is less than R/2;

for all marked combinations, computing the overhead; and

selecting from among all combinations of K and R wherein an associated overhead was computed, the combination yielding a minimum overhead.

108. (Amended) A method of [dispatcher for] distributing a high speed data stream among a plurality of modem elements, said method comprising the steps of:

providing a two dimensional buffer comprising a plurality of cells arranged as a plurality of rows and columns, each row associated with a different modem element and each column representing a single symbol, transmitted at the highest transmission rate;

[an input sequencer adapted to distribute] distributing said high speed data stream to cells in said buffer, the amount of data distributed to each row is determined in accordance with the particular data rate of the modem corresponding thereto; and

[an output sequence adapted to distribute] distributing the contents of the cells in said buffer to said plurality of modem elements.

109. (Amended) The [dispatcher] method according to claim 108, wherein said [input sequencer comprises filling means for] step of distributing said high speed data stream comprises the steps of:

filling the cells of said buffer with bytes beginning with the first cell of the first row;

finding the next available cell in said buffer;

placing a byte in the next available cell if the maximum allowable number of bytes from one codeword have not yet been placed in the particular row; and

repeating said steps of finding and placing for all codewords in [one] a cycle of said [input sequencer] method.

110. (Amended) The [dispatcher] method according to claim 109, wherein said step of filling [means] comprises filling any unfilled cells with null symbols.

111 (Amended) The [dispatcher] method according to claim [108] 58, further comprising [means for] the step of transmitting periodically a spatial frame synchronization word over said plurality of twisted pair lines, said spatial frame synchronization word operative to compensate for variable delays in each of said twisted pair lines.

Kindly add new claims 112 -144.

112. The apparatus according to claim 1, where said service channel module is adapted to interface to Synchronous Digital Hierarchy (SDH) STM-1 service.

113. The apparatus according to claim 1, where said service channel module is adapted to interface to Synchronous Optical Network OC-3 service.

114. The apparatus according to claim 31, further comprising means for transmitting more sensitive data over more spatial central pairs and transmitting less sensitive data over less spatial central pairs.

115. The method according to claim 71, wherein said service channel module is adapted to interface to Synchronous Digital Hierarchy (SDH) STM-1 service.

116. The method according to claim 71, wherein said service channel module is adapted to interface to Synchronous Optical Network OC-3 service.

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117. The method according to claim 87, further comprising means for transmitting more sensitive data over more spatial central pairs and transmitting less sensitive data over less spatial central pairs.

118. A method of waking up an apparatus for transporting a high speed data stream over a plurality of modem elements via a channel consisting of a plurality of relatively low bandwidth twisted copper pair lines, each modem element having a data rate, delay, signal to noise ratio and bit error ratio (BER) independent of other modem elements, said method comprising the steps of:

setting each modem element to its lowest bit rate;

estimating the maximum rate of each modem element per link;

setting each modem element to its optimal bit rate; and

measuring the parameters of the link and in response thereto modifying the data rates of any modem elements that have lost synchronization or are not operating properly.

119. The method according to claim 118, further comprising the step of configuring a data dispatcher and Forward Error Correction tables in accordance with the data rates of each modem element.

120. The method according to claim 118, further comprising the step of periodically monitoring and measuring the link parameters and modifying the data rates of said modem elements in accordance thereto so as to adapt the transmission to changes in said channel.

121. The method according to claim 118, wherein said step of calculating the optimal bit rates of said modem elements comprises the step of calculating the Near End Crosstalk (NEXT) transfer function matrix $H_{ij}(f)$ for all or a portion of said twisted pairs.

122. The method according to claim 118, wherein said step of calculating the optimal bit rates of said modem elements comprises allocating pairs located more centrally within a binder to more sensitive data and allocating pairs located less centrally within said binder less sensitive data.

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123. The method according to claim 118, wherein said step of calculating the optimal bit rates of said modem elements comprises determining the maximum transmit power and gain permitted for each twisted pair.

124. The method according to claim 118, wherein said step of calculating the optimal bit rates of said modem elements comprises determining the optimal transmission rate for each direction of each twisted pair link.

125. The method according to claim 118, wherein said step of calculating the optimal bit rates of said modem elements comprises determining the maximum effective data payload rate for each link in each direction.

126. The method according to claim 118, wherein said step of calculating the optimal bit rates of said modem elements comprises selecting an error code scheme for use in transmitting and receiving data over said links.

127. The method according to claim 58, further comprising a wake up process comprising the steps of:

setting each modem element to its lowest bit rate;

estimating the maximum rate of each modem element per link;

setting each modem element to its optimal bit rate; and

measuring the parameters of the link and in response thereto modifying the data rates of any modem elements that have lost synchronization or are not operating properly.

128. The method according to claim 127, further comprising the step of configuring a data dispatcher and Forward Error Correction tables in accordance with the data rates of each modem element.

129. The method according to claim 127, further comprising the step of periodically monitoring and measuring the link parameters and modifying the data rates of said modem elements in accordance thereto so as to adapt the transmission to changes in said channel.

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130. A method of canceling near end crosstalk (NEXT) in an apparatus for transporting a high speed data stream over a plurality of modem elements via a channel consisting of a plurality of relatively low bandwidth twisted copper pair lines, each modem element having a data rate, delay, signal to noise ratio and bit error ratio (BER) independent of other modem elements, said method comprising the steps of:

generating an estimate of a NEXT transfer function of the crosstalk caused by radiators nearby to a modem element;

generating an estimate of a NEXT disturbance signal in accordance with said estimated NEXT transfer function; and

subtracting said estimate of a NEXT disturbance signal from the signal received by a modem element.

131. A near end crosstalk (NEXT) canceller in a facility transport device adapted to transport a high speed data stream over a plurality of modem elements via a channel consisting of a plurality of relatively low bandwidth twisted copper pair lines, each modem element having a data rate, delay, signal to noise ratio and bit error ratio (BER) independent of other modem elements, comprising:

means for receiving a plurality of transmitted signals $T_j(t)$ generated by one or more transmitters;

means for estimating the NEXT transfer functions $H_{ij}(t)$ representing the transmission function between pairs of modem elements;

means for generating a combined signal $\sum T_j(t) * H_{ij}(t)$ using the NEXT transfer function associated with each pair of modem elements;

a subtractor adapted to subtract said combined signal from a received signal so as to generate a NEXT cancelled signal which; and

means for utilizing said NEXT cancelled signal as a feedback signal in the adaptation of said NEXT canceller.

132. The NEXT canceller according to claim 131, further comprising means for performing NEXT cancellation separately for each carrier or tone.

133. The NEXT canceller according to claim 131, further comprising means for generating a different NEXT cancelled signal for input to each receiver in said device.

134. The NEXT canceller according to claim 131, wherein said NEXT cancellation is performed utilizing a frequency domain representation of the transmitted signals $T_j(f)$, frequency domain representation of the NEXT transmission functions $H_{ij}(f)$ whereby a combined signal is generated using $\sum T_j(f) \cdot H_{ij}(f)$.

135. A method of measuring the pair isolation in an apparatus for transporting a high speed data stream over a plurality of modem elements via a channel consisting of a plurality of relatively low bandwidth twisted copper pair lines located in binders, each modem element having a data rate, delay, signal to noise ratio and bit error ratio (BER) independent of other modem elements, said method comprising the steps of:

turning on transceivers within the modem elements connected to each line without transmitting signal onto the line;

measuring the noise level present at each pair which represents the isolation level for that particular line; and

allocating more isolated pairs to data signals having higher sensitivities to disturbances.

136. The method according to claim 135, wherein said step of measuring comprises performing power measurements using a received signal power meter integral with said modem elements.

137. The method according to claim 135, wherein said step of measuring comprises performing power measurements using a received signal to noise ratio (SNR) meter integral with said modem elements.

138. The method according to claim 135, wherein said step of measuring comprising performing power measurements using a test module adapted to measure power spectral density (PSD).

139. A method of allocating transmit power in an apparatus for transporting a high speed data stream over a plurality of modem elements via a channel consisting of a plurality of relatively low bandwidth twisted copper pair lines located in binders, each modem element having a data rate, delay, signal to noise ratio and bit error ratio (BER) independent of other modem elements, said method comprising the steps of:

varying the transmission power of modem elements using internal pairs of a binder;
measuring the power on the lines located on the perimeter of the binder; and
adjusting the transmission power of a modem element whose measured power exceeds a predetermined threshold.

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140. The method according to claim 139, wherein said step of measuring comprises performing power measurements using a received signal power meter integral with said modem elements.

141. The method according to claim 140, wherein said step of measuring comprises performing power measurements using a received signal to noise ratio (SNR) meter integral with said modem elements.

142. The method according to claim 140, wherein said step of measuring comprising performing power measurements using a test module adapted to measure power spectral density (PSD).

143. A method of allocating transmit frequency bandwidth in an apparatus for transporting a high speed data stream over a plurality of modem elements via a channel consisting of a plurality of relatively low bandwidth twisted copper pair lines located in binders, each modem element having a data rate, delay, signal to noise ratio and bit error ratio (BER) independent of other modem elements, said method comprising the steps of:

turning on transceivers within the modem elements connected to each line without transmitting signal onto the line;

measuring the noise level present at each pair which represents the isolation level for that particular line; and

allocating more broadband transmissions to more isolated pairs within a binder.

144. The method according to claim 143, wherein said step of measuring comprises performing power measurements using a received signal power meter integral with said modem elements.

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145. The method according to claim 143, wherein said step of measuring comprises performing power measurements using a received signal to noise ratio (SNR) meter integral with said modem elements.

146. The method according to claim 143, wherein said step of measuring comprising performing power measurements using a test module adapted to measure power spectral density (PSD).

147. The apparatus according to claim 1, wherein said decoder comprises means for utilizing feedback information consisting of notifications of faulty modem elements to generate erasure information indicating erroneous received data, so as to enhance the performance of said decoder.